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(54) Steering column clamping mechanism.

(57) A rake and reach adjustable steering column (1) is secured in its desired location by means of a clamping mechanism (2). The clamping mechanism includes a cam (10) on camming surfaces on which rollers (11) held in a body (13) freely run. A bolt (15) extends from the cam and roller arrangement through a mounting bracket (6) for the steering column and through a member (16) fixed to the steering column (3).

The body (13) is rotatable by a handle (14) which, through the cam and roller arrangement, causes thrust washers (22) and other parts (10, 20) to release and clamp the steering column in position.

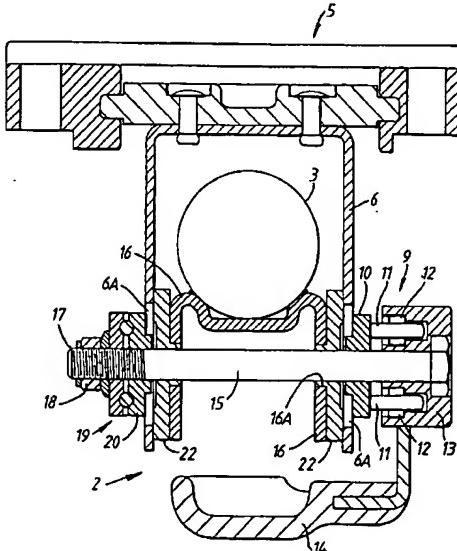


Fig. 2

This invention relates to a steering column clamping mechanism for an adjustable steering column.

A steering column clamping mechanism is known from EP-A-O 242 928 which clamps a housing of an adjustable steering column perpendicularly to the longitudinal direction of the steering column. That mechanism comprises a clamping bolt and a lever by which the bolt can be tensioned and the column housing fixed, there being a spring-loaded element between the housing and bolt with the lever and bolt being coupled by pins whose centre lines cross that of the bolt when it is in released condition. The pins are provided between a cup fixed to the bolt and the lever, the pins being longer than the distance, measured in the longitudinal direction, between the cup and lever in the released condition of the bolt, a limited degree of tilting of the pins on their supporting points being possible.

According to one aspect of the present invention, there is provided a steering column clamping mechanism for an adjustable steering column, the mechanism in an unclamped condition allowing movement of the column in an axial direction and/or tilting movement and in a clamped condition serving to prevent said movement, and the mechanism having an actuating member including a cam and roller arrangement to create said clamped and unclamped conditions and comprising an actuating member having at least two roller members thereon and a cam member in rolling engagement with the roller members, the cam member having cam tracks for the roller members, characterised in that each track has a first zone, a second zone and a third zone, the third zone being between the first zone and the second zone, the first zone being lower than the second zone and the third zone being higher than the second zone, and the first zone corresponding to the unclamped condition and the second zone corresponding to the clamped condition.

According to another aspect of the present invention, there is provided a steering column clamping mechanism for an adjustable steering column, the mechanism having an unclamped condition allowing movement of the steering column in an axial direction and/or tilting movement and having a clamped condition preventing movement of the steering column, the mechanism comprising a steering column mounting bracket having two sides extending beyond the steering column; a saddle-like steering column retainer member fixed to the steering column and having two sides extending away from the steering column; and a bolt arrangement coupling the steering column mounting bracket and the steering column retainer member, the bolt arrangement including a bolt, an actuating member, a cam member, rolling members in rolling engagement with the cam member and the actuating member and a plurality of clamping members, the actuating member being rotatable about an axis

extending through the bolt; the sides of the steering column mounting bracket and the sides of the steering column retainer member resiliently biasing the clamping members into engagement with the steering column mounting bracket and the steering column retainer member when the clamping mechanism is in the clamped condition.

The invention also extends to an adjustable steering column incorporating a clamping mechanism essentially as just defined.

The first zone of the cam surface track provides a low spot for the rollers, which is the unclamped condition of the mechanism, and the second zone a higher spot for the rollers, which provides the clamped condition of the mechanism. The third zone provides an even higher spot between the former two spots, thereby to provide an over-pressure run-in for the roller members to be urged by the cam member into the position where the mechanism is in its clamped condition. The roller members can run freely on pins mounted in the body.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 is a diagrammatic side view of an adjustable steering column incorporating a clamping mechanism,

Figure 2 is a diagrammatic sectional view showing the steering column with its clamping mechanism in more detail,

Figure 3 is a diagrammatic perspective view of a cam of a cam means of the clamping mechanism, Figure 4 is a diagrammatic view of the cam viewed in the direction of A in Figure 3 and showing possible locations of a roller of the cam means,

Figure 5 is a diagrammatic perspective view of the assembled cam and roller arrangement,

Figure 6 is a diagrammatic exploded view of part of the clamping mechanism to illustrate how the steering column can be reach-adjustable, and

Figure 7 is a diagrammatic perspective view of a steering column mounting bracket and part of the clamping mechanism to illustrate how the steering column can be rake adjustable.

Referring to the drawings, Figure 1 illustrates a rake and reach adjustable steering column, i.e. one in which a steering wheel 1 can be tilted in the directions of the double arrow A and/or adjusted parallel to the longitudinal axis of the steering column in the directions indicated by the double arrow B respectively. The steering column is held in its desired location by means of a clamping mechanism 2.

The steering column diagrammatically illustrated in Figure 1 by reference numeral 3 (with other possible rake positions thereof) is mounted by means of steering column mounting points 4 and 5 in a vehicle.

The steering column mounting point 5 includes a mounting bracket 6, which is also illustrated in Figures 2 and 7.

Figure 1 also shows a steering column pivot point 7 about which the steering column and steering wheel are rake adjustable, and a steering box 8.

As best shown in Figure 2, the steering column clamping mechanism 2 is formed around the mounting bracket 6 and includes a cam means 9 in the form of a cam and roller arrangement with a cam 10 and at least two rollers 11 freely running on axles 12 coaxially mounted in a body 13 which is rotatable about an axis at right angles to the axles 12. A handle 14 is connected to the body 13 to effect rotation thereof to move the clamping mechanism 2 between clamped and unclamped conditions. In Figure 1, the handle 14 depicted in full lines indicates the clamped position, whereas the unclamped position is illustrated in dashed lines. A bolt 15 or other member is secured in the body 13 and extends co-axially with the axis of rotation of the body 13.

As shown in Figures 2 and 6, a saddle-like steering column retainer member 16 is welded to the underside of the steering column 3 and is provided with two longitudinal slots 16A, through which the bolt 15 passes, thereby allowing movement of the steering column 3 parallel to its axis about the bolt 15.

Figures 2 and 7 illustrate that the mounting bracket 6 is provided with two slots 6A, which extend at right angles to the slots 16A and through which the bolt 15 also passes. The slots 6A allow the tilting movement of the steering column 3 relative to the bracket 6 about the double arrow A in Figure 1.

The bolt 15 or other member extends through the bracket 6 from the body 13 end of the clamping mechanism and ends in a screwthread 17 with a nut 18 which tightens the mechanism to bring the rollers 11 into rolling contact with the cam 10. A roller bearing 19 is provided to allow rotation of the bolt 15 relative to a part 20. The part 20, which corresponds to the cam 10 on the opposite side of the bracket 6 (which is likewise constructed on the side concerned) has a rectangular protrusion 21 which fits in the slot 6A of the bracket 6 so that, when the mechanism is in its unclamped condition, the part 20 and the cam 10 can slide in their slots 6A for rake adjustment of the steering column.

A pair of thrust washers 22 are provided with a clearance fit about the bolt 15 adjacent respective internal faces of the mounting bracket 6 and each thrust washer 22 is provided with a rectangular protrusion 23 which is slidably mounted in the respective slots 16A of the saddle-like steering column retainer member 16. This latter construction allows for the movement of the steering column 3 in the direction of its axis when the clamping mechanism is in its unclamped condition for reach adjustment of the steering column.

Figures 3 to 5 show the cam and roller arrangement of the clamping mechanism and it will be seen that the cam 10 has cam tracks 10A on one face of the cam, each providing for a respective roller 11 a first zone which is a low spot 10B for the clamping mechanism unclamped condition, a second zone which is a higher spot 10C for the clamping mechanism clamped condition and a third zone between the first and second zones forming an even higher spot 10D over which each roller 11 has to run to reach the clamped condition, this higher spot 10D thereby providing means urging and serving to retain by force the rollers 11 seated in the spots 10B and 10C. Thus, a certain amount of resistance has to be overcome, using the handle 14, to rotate the body 13 and therefore the rollers 11 to bring the clamping mechanism into and out of the clamped condition. The sides of the bracket 6 and the member 16 have sufficient resilience in themselves to allow the rollers 11 to run over their high spots 10D.

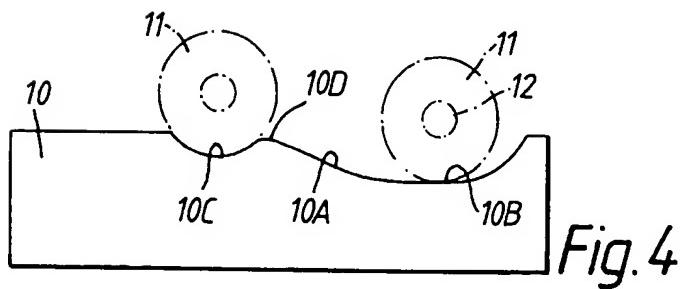
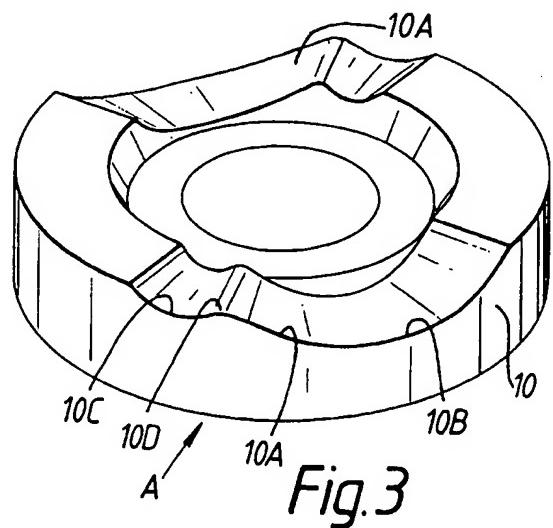
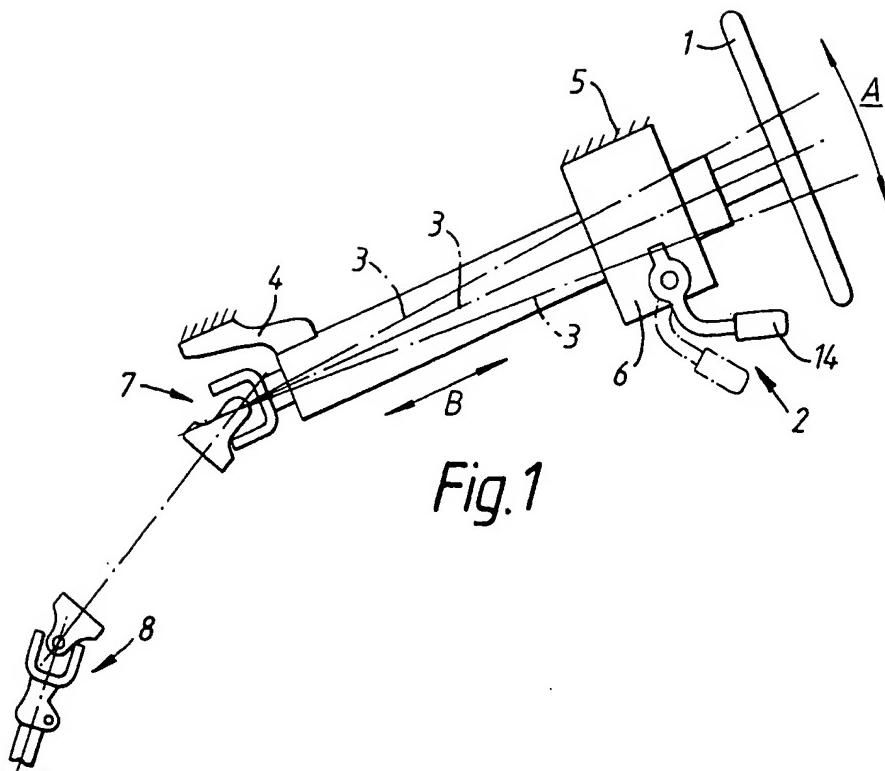
The rollers 11 themselves can be mounted as illustrated on individual axles 12 slotted in the body 13 or, for example, a single axle 12 can be inserted through the side of the body 13 through an aperture 13A (Figure 5) in the side of the body 13, thereby mounting both rollers on a single axle.

When the clamping mechanism is in its clamped condition, the parts 10, 20 and 22 are pressed against the sides of the parts 6 and 16 as described hereinabove in order to prevent reach and rake adjustment of the steering column 3 and its steering wheel 1.

35 Claims

1. A steering column clamping mechanism (2) for an adjustable steering column (3), the mechanism in an unclamped condition allowing movement of the column in an axial direction and/or tilting movement and in a clamped condition serving to prevent said movement, and the mechanism having an actuating member including a cam and roller arrangement to create said clamped and unclamped conditions and comprising an actuating member (9) having at least two roller members (11) thereon and a cam member (10) in rolling engagement with the roller members, the cam member having cam tracks (10A) for the roller members, characterised in that each track has a first zone (10B), a second zone (10C) and a third zone (10D), the third zone being between the first zone and the second zone, the first zone being lower than the second zone and the third zone being higher than the second zone, and the first zone corresponding to the unclamped condition and the second zone corresponding to the clamped condition.

2. A mechanism according to claim 1, wherein the actuating member (9) includes a body (13) rotatable about an axis extending through the cam member.
3. A mechanism according to claim 2, wherein the roller members travel in a circular path in the cam tracks, the axis of the circular path being the same as the body axis.
4. A mechanism according to claim 3, wherein said roller members run freely on pins (12) mounted in said actuating member.
5. A mechanism according to claim 2, 3 or 4, wherein a bolt (15) is held in said body, extends co-axially with the axis of rotation of said body and passes through the cam member and through a bracket (6) serving to support the steering column (3) on a mounting point (5) and also through a steering column retainer member (16) fixed to the steering column and through parts (6) which cause the member to be clamped relatively to the bracket when the clamping mechanism is in its clamped condition and to allow movement of the member relatively to the bracket when the mechanism is in its unclamped condition.
6. A steering column clamping mechanism for an adjustable steering column (3), the mechanism having an unclamped condition allowing movement of the steering column in an axial direction and/or tilting movement and having a clamped condition preventing movement of the steering column, the mechanism comprising a steering column mounting bracket (6) having two sides extending beyond the steering column; a saddle-like steering column retainer member (16) fixed to the steering column and having two sides extending away from the steering column; and a bolt arrangement coupling the steering column mounting bracket and the steering column retainer member, the bolt arrangement including a bolt (15), an actuating member (9), a cam member (10), rolling members (11) in rolling engagement with the cam member and the actuating member and a plurality of clamping members (10, 22), the actuating member being rotatable about an axis extending through the bolt; the sides of the steering column mounting bracket (6) and the sides of the steering column retainer member (16) resiliently biasing the clamping members into engagement with the steering column mounting bracket and the steering column retainer member when the clamping mechanism is in the clamped condition.
7. A mechanism according to claim 5 or 6, wherein said bracket is slotted to allow passage of said bolt therethrough, the direction of the or each slot (6A) extending in a direction to allow said tilting movement.
8. A mechanism according to claim 5, 6 or 7, wherein in said steering column retainer member is slotted to allow passage of said bolt, the or each slot (16A) extending in a direction to allow said movement of the steering column in an axial direction.
9. An adjustable steering column incorporating a clamping mechanism according to any one of the preceding claims.



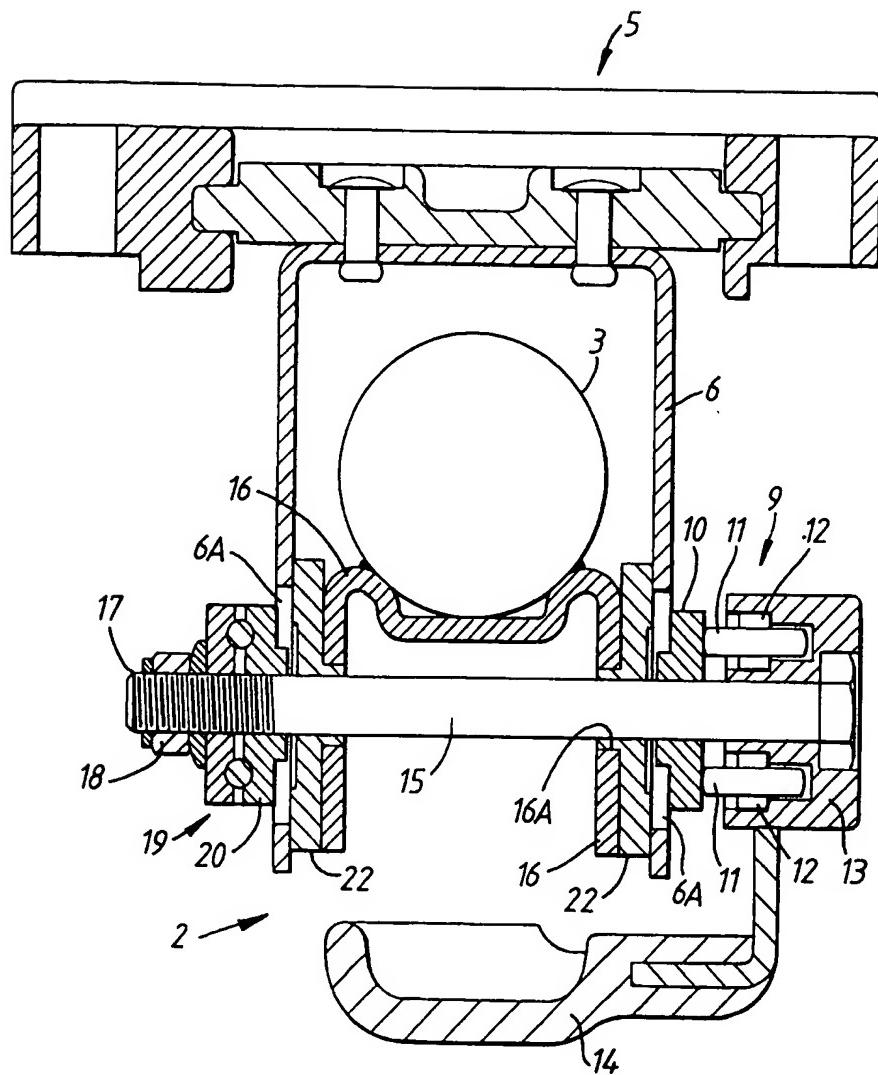


Fig. 2

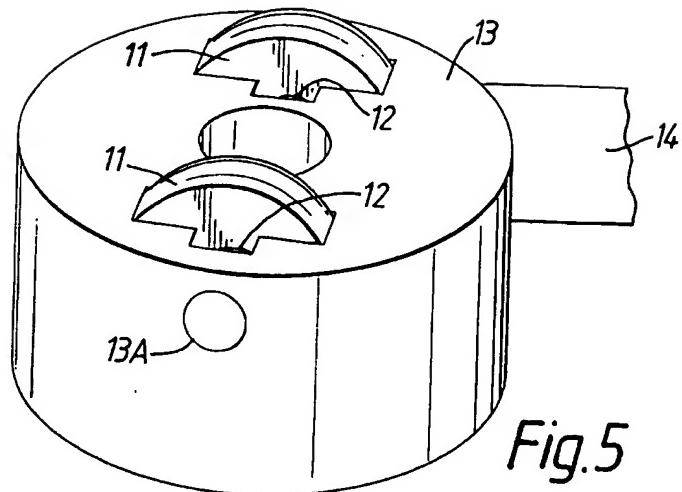


Fig. 5

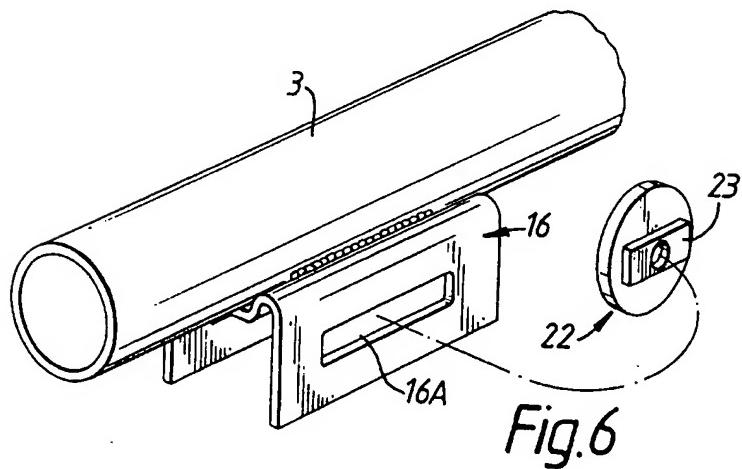


Fig. 6

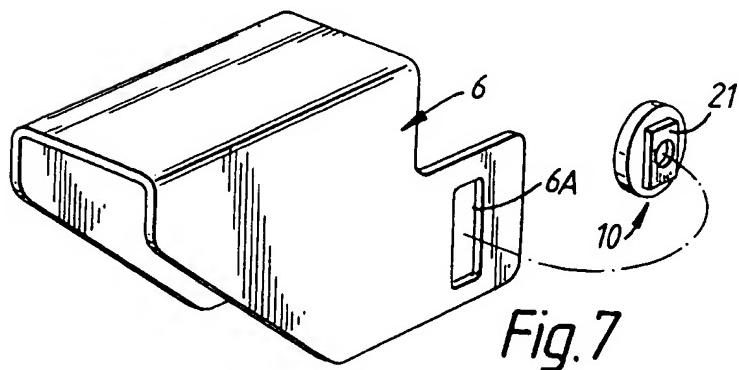


Fig. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 93 30 9521

DOCUMENTS CONSIDERED TO BE RELEVANT					
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CLS)		
X	EP-A-0 493 181 (ECIA - EQUIPEMENTS ET COMPOSANTS POUR L'INDUSTRIE AUTOMOBILE) * page 2, column 2, line 51 - page 5, column 7, line 2; figures *	6,9	B62D1/18		
Y	---	7,8			
A	---	1-5			
Y	DE-C-39 20 783 (BAYERISCHE MOTOREN WERKE AG) * column 2, line 26 - column 3, line 52; figures *	7,8			
A	---				
A	GB-A-2 113 164 (FORD MOTOR COMPANY LIMITED) * page 1, right column, line 93 - page 2, right column, line 109; figures *	1,5,6,9			
A	---				
A	US-A-4 244 237 (SPRUNGER) * column 4, line 33 - column 6, line 30; figures *	1-7,9			
D,A	EP-A-0 242 928 (VOLVO CAR B.V.) ---				
P,X	DE-U-93 00 387 (LEMFÖRDER METALLWAREN AG) * page 1, paragraph 5 - page 2, last paragraph; claim 3; figures *	1-3,5-9	B62D F16B F16D B62K		
P,A	-----	4			
The present search report has been drawn up for all claims					
Place of search	Date of completion of the search	Examiner			
THE HAGUE	4 March 1994	Kulozik, E			
CATEGORY OF CITED DOCUMENTS					
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document					
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same parent family, corresponding document					